SEMESTER -7

ARTIFICIAL ORGANS AND IMPLANTS

Course Code	OEBMT724	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3-0-0-0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	NONE	Course Type	OE

Course Objectives:

1. To understand the design, principles and applications of various types of artificial and tissue derived implants.
2. To understand the use of 3D printing technology in implantation.

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	Basics of artificial organ design process- the hip joint and its artificial replacement-the eye and its artificial replacement-the lung and its artificial replacement, artificial heart-design of heart valves-	9
2	Basics of artificial organ design process-Kidney and its artificial replacement-skin and the design of artificial skin-the liver and its artificial replacement-The medical device market and ethical issues of implants-the manufacturing, testing and sterilization of implants.	9
3	Applications of Tissue Engineering in artificial organ design - fundamentals of tissue engineering, Engineering biomaterials for tissue engineering-Drug Delivery- Gene Therapy.	9
4	Fundamentals of 3D printing and its applications in Biomedical engineering-stages of 3D printing process-3D modeling-printing-post processing-Types of 3D printing technologies-Biomedical applications of 3D printing technology- maxillofacial surgery- upper limb prosthetics.	9

Course Assessment Method

(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

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Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explore different kind of artificial organs	**K2, K3**
CO2	Explore the medical device market and ethical issues of implants	**K2, K4**
CO3	Review the basic principles of Tissue Engineering	**K2, K3**
CO4	Explore the use of 3D printing technology in Biomedical field	**K2, K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3		1				1		3
CO2	3	3	3	3		1				1		3
CO3	3	3	3	3		1				1		3
CO4	3	3	3	3		1				1		3

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Design of artificial human joints & organs	Subrata Pal	Springer	2014
2	Tissue engineering: principles and practices	Fisher JP, Mikos AG, Bronzino JD, Peterson DR	CRC Press	2012
3	3D Printing in Biomedical Engineering	Singh S, Prakash C, Singh R	Springer	2020

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Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Biomaterials, artificial organs and tissue engineering	Larry L. Hench, Julian R. Jones	Woodhead Publishing Limited	2005
2	Advanced 3D-printed systems and nanosystems for drug delivery and tissue engineering	Du Toit L, Kumar P, Choonara Y, Pillay V	Elsevier	2020

Video Links (NPTEL, SWAYAM…)	
Sl. No	**Link ID**
1	https://www.youtube.com/watch?v=gPjDsJJcYlA&list=PLgMDNELGJ1CaY5lay_oi1xqBGsqgt4Mrm&index=1&pp=iAQB
2	https://www.youtube.com/watch?v=b5HwDYEWul8

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